

MATTHEW B. SWITANEK

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EDUCATION

2008-2013 University of Arizona

Ph.D., Hydrometeorology

Dissertation Title: Forecasting Climate and Water Resources in the Context of Natural Variability and Climate Change

Committee: Dr. Peter A. Troch (principal advisor), Dr. Christopher L. Castro, Dr. Hoshin V. Gupta, and Dr. Francina Dominguez

2006-2008 University of Arizona

M.S., Hydrology

Thesis Title: Improving Seasonal Predictions of Climate Variability and Water Availability at the Catchment Scale

1998-2003 University of Arizona

B.S., Civil Engineering

EMPLOYMENT

Nov 2018 – present

Research Scientist II

CIRES / NOAA (Boulder, Colorado)

Primary tasks: Develop successful methodologies to improve postprocessing and statistical forecasts of sub-seasonal to seasonal climate variables. Compare and compliment skills from dynamical ensemble members with statistical methods. Apply successful seasonal forecasts of precipitation and temperature to better predict snow water equivalent across the Intermountain West. Improve sub-seasonal forecasts of tropical cyclone activity.

Jul 2014 – Feb 2018

Postdoctoral Research Scientist

Wegener Center for Climate and Global Change (Graz, Austria)

Primary tasks: Improved upon existing methodologies to bias correct and

downscale climate model output. Developed and implemented a univariate bias correction scheme that preserves modeled changes between two time periods. Additionally, I formulated and implemented an algorithm to effectively downscale precipitation from lower to higher gridded resolutions. This was performed using a conditional transformed multivariate Gaussian model. The simulated fields had the expected covariance structure, while maintaining tail dependence.

Aug – Sep 2013

Hydrometeorologist

The Nature Conservancy / Climate Assessment for the Southwest (Tucson, USA)

Primary tasks: Assessed climate change impacts on streamflow volumes and extremes in the Gila River Basin, New Mexico. Bias corrected an ensemble of 5 dynamically downscaled GCMs, and subsequently used the climatic variables to force the VIC hydrologic model to obtain projected streamflows. The project was collaborative and included climate scientists, hydrologists, water resource managers, and ecologists.

Aug 2006 – Aug 2013

Research Assistant

University of Arizona / Bureau of Reclamation (Tucson, USA)

Primary tasks: Carried out a variety of projects related to climate variability and climate change, and modeled how these processes translated to changes in water availability. These projects involved other academics and professionals from hydrology, meteorology, dendrochronology, agricultural economics, along with water resource institutions and policy makers.

RESEARCH INTERESTS

My main interest is focusing on the impacts that climate variability and change are expected to have on water availability and natural hazards. In this effort, I strive to develop new and innovative sub-seasonal to seasonal prediction models, in addition to downscaling and bias correction methodologies for General Circulation Models (or Regional Climate Models). All of my research efforts strive to provide better operational guidance to assist the decision-making process of resource managers. My ongoing goal is to provide accurate climate data that is relevant and accessible to other scientists, stakeholders, and the general public.

SKILLS

- Proficient at the Python programming language to perform data processing, statistical analyses (regression, eigen analysis, statistical significance), modeling, and visualization
- Experience with algorithm design and implementation in Python

- Very skilled performing tasks in Windows and Unix operating systems
- Experienced using GIS software such as SAGA or ESRI
- Other technical skills include Excel, Word, Powerpoint, Matlab, SQLite

RESEARCH SKILLS

- Created original bias-correction and downscaling methods in order to provide ensembles of projected changes to precipitation and temperature
- Experienced in scripting in Python with very large data sets, data manipulation, data visualization, model prediction and simulation, and significance testing
- Have worked in teams across disciplines, most recently with a group of hydrologists and meteorologists
- Proficient with the Variable Infiltration Capacity (VIC) hydrologic model under present and future climate scenarios
- Model calibration using the Shuffled Complex Evolution (SCE) algorithm

PUBLICATIONS

- Switanek, M. B., Barsugli, J. J., Scheuerer, M., and Hamill, T. M., 2020: Present and past sea surface temperatures: a recipe for better seasonal climate forecasts. *Weather and Forecasting*, **35**, 1221-1234, doi:10.1175/WAF-D-19-0241.1.
- Scheuerer, M., Switanek, MB; Worsnop, RP; Hamill, TM, 2020: Using artificial neural networks for generating probabilistic subseasonal precipitation forecasts over California. *Monthly Weather Review*, **148**, 3489-3506, doi:10.1175/MWR-D-20-0096.1.
- Switanek, M. B., Troch, P. A., Castro, C. L., Leuprecht, A., Chang, H.-I, Mukherjee, R., and Demaria, E. M. C., 2017: Scaled distribution mapping: a bias correction method that preserves raw climate model projected changes. *Hydrology and Earth System Sciences*, **21**, 2649–2666, doi:10.5194/hess-21-2649-2017.
- Switanek, M., Crailsheim, K., Truhetz, H., and Brodschneider, R., 2017: Modelling seasonal effects of temperature and precipitation on honey bee winter mortality in a temperate climate. *Science of the Total Environment*, **579**, 1581-1587, doi:10.1016/j.scitotenv.2016.11.178.
- Reszler, C., Switanek, M. B., and Truhetz, H., 2018: Convection-permitting regional climate simulations for representing floods in small and medium sized catchments in the Eastern Alps, *Natural Hazards and Earth System Sciences*, **18**, 2653-2674, doi:10.5194/nhess-18-2653-2018.
- Haas, J., Birk, S., and Switanek, M., 2018: Analysis of hydrological data with correlation matrices: Technical implementation and possible applications, *Environmental Earth Sciences*, **77**, 310 (2018), doi:10.1007/s12665-018-7469-4.
- Gori, D., Cooper, M. S., Soles, E. S., Stone, M., Morrison, R., Turner, T. F., Propst, D. L., Garfin, G., Switanek, M., Chang, H., Bassett, S., Haney, J., Lyons, D., Horner, M., Dahm, C. N., Frey, J. K., Kindscher, K., Walker, H. A., and Bogan, M. T., 2014: Gila River Flow Needs Assessment. A report by The Nature Conservancy, doi:10.13140/2.1.4301.1521.
- Switanek, M. B., and Troch, P. A., 2011: Decadal prediction of Colorado River streamflow anomalies using ocean-atmosphere teleconnections. *Geophysical Research Letters*, **38**, L23404, doi:10.1029/2011GL049644.
- Switanek, M. B., Troch, P. A., and Castro, C. L., 2009: Improving seasonal predictions of climate variability and water availability at the catchment scale. *Journal of Hydrometeorology*, **10**, 1521-1533, doi:10.1175/2009JHM1073.1.

Guardiola-Claramonte M., Troch, P. A., Breshears, D. D., Huxman, T. E., Switanek, M. B., Durcik, M., and Cobb, N. S., 2011: Decreased streamflow in semi-arid basins following drought-induced tree die-off: A counter-intuitive and indirect climate impact on hydrology. *Journal of Hydrology*, **406**, 225-233, doi:10.1016/j.jhydrol.2011.06.017.

Troch, P. A., Carrillo, G. A., Heidbuchel, I., Rajagopal, S., Switanek, M. B., Volkman, T., and Yaeger, M., 2008: Dealing with landscape heterogeneity in watershed hydrology: A review of recent progress toward new hydrological theory. *Geography Compass*, **3**, 375-392, doi:10.1111/j.1749-8198.2008.00186.x.

PRESENTATIONS

Switanek, M. B., Barsugli, J. J., Scheuerer, M., and Hamill, T., Jan 2020: Persistent and reemergent sea surface temperatures: a recipe for better seasonal climate forecasts. Boston, MA, USA.

Switanek, M. B., Barsugli, J. J., Scheuerer, M., and Hamill, T., Nov 2019: Present and past sea surface temperatures: a recipe for better seasonal climate forecasts. Winter Outlook Workshop, La Jolla, CA, USA.

Switanek, M. B., Barsugli, J. J., Scheuerer, M., and Hamill, T., Dec 2019: Persistent and reemergent sea surface temperatures: a recipe for better seasonal climate forecasts. AGU 2019, San Francisco, CA, USA.

Scheuerer, M., Switanek, M. B., Hamill, T., and Worsnop, R., Dec 2019: Using artificial neural networks for generating probabilistic subseasonal precipitation forecasts over California. AGU 2019, San Francisco, CA, USA.

Switanek, M. B., Troch, P., Castro, C., Leuprecht, A., Chang, H.-I., Mukherjee, R., Demaria, E., and Maraun, D., 2017: Scaled distribution mapping: a bias correction method that preserves raw climate model projected changes. Poster presentation, EGU2017-13181, European Geosciences Union General Assembly.

Switanek M. B., Truhetz, H., and Reszler, C., 2015: Climate change impacts on flooding in southeastern Austria. Poster presentation, EGU2015-9780, European Geosciences Union General Assembly.

Switanek M. B., Brodschneider, R., Crailsheim, K., and Truhetz, H., 2015: Impacts of Austrian climate variability on honey bee mortality. Poster presentation, EGU2015-9575, European Geosciences Union General Assembly.

Braun, M., Maraun, D., Switanek, M., Prenner, D., and Kaitna, R., 2018: Analysis of past and future meteorological trigger probabilities for torrential processes in Austria using regional climate projections from the EURO-CORDEX initiative. Poster presentation, EGU2018-16434, European Geosciences Union General Assembly.

Reszler, C., Truhetz, H., and Switanek, M., 2016: Effect of grid size in RCMs on the representation of floods in small and medium sized catchments in Austria: added value of convection-permitting simulations. Poster presentation, EGU2016-8378, European Geosciences Union General Assembly.

Nikulin, G., Bosshard, T., Yang, W., Barring, L., Wilcke, R., Vrac, M., Vautard, R., Noel, T., Gutiérrez, J. M., Herrera, S., Fernández, J., Haugen, J. E., Benestad, R., Landgren, O. A., Grillakis, M., Ioannis, T., Koutroulis, A., Dosio, A., Ferrone, A., and Switanek, M., 2015: Bias Correction Intercomparison Project (BCIP): an introduction and the first results. Poster presentation, EGU2015-2250, European Geosciences Union General Assembly.